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REMARKS

Claims 1-3, 5-7, and 9-20 are all of the claims presently pending in the application.

Claim 3 has been withdrawn from consideration as being directed to a non-elected species of the invention. (Applicants respectfully note that page 1 of the Office Action states that claims 1, 2, 5-7, and 9-18 are pending. However, claim 3 has been withdrawn (not canceled), and therefore, claim 3 also is pending in the present application. Thus, the pending claims are claims 1-3, 5-7, and 9-18.)

Claims 1 and 13 are amended merely to provide proper antecedent basis and to define more clearly and particularly the features of the claimed invention, thereby overcoming the rejection of claim 13 under 35 U.S.C. § 112.

Claim 5 is rewritten in independent form, including all of the features of base claim 4. Claim 4 correspondingly is canceled without prejudice or disclaimer. Also, claims 16 and 18 correspondingly are amended merely to change their dependency from claim 4 to claim 5.

New claims 19 and 20 are added to provide more varied protection for the invention, as illustrated, for example, in Figure 2.

It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicants specifically state that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claim 13 stands rejected under 35 U.S.C. § 112, second paragraph. Applicant notes that claim 13 is rejected only under 35 U.S.C. § 112, and not on prior art grounds. Thus, claim 13 is believed to be allowable over the cited references.

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Claims 1 and 2 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Jones, et al. (U.S. Patent No. 6,417,899; hereinafter "Jones") in view of Ichihashi (U.S. Patent No. 6,686,980). Claims 4-6, 11, 12, and 14-18 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Jones in view of Ichihashi, in further view of Applicants' Admitted Prior Art (Figures 11 and 12). Claims 7 and 10 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Jones in view of Applicants' Admitted Prior Art (Figures 11 and 12) in view of Yoshihiro (JP 9-331066). Claim 9 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Jones in view of Applicants' Admitted Prior Art (Figures 11 and 12), in view of in view of Yoshihiro, and further in view of Ichihashi.

These rejections are respectfully traversed in the following discussion.

I. THE CLAIMED INVENTION

The claimed invention is directed to a liquid crystal display having improved brightness.

In an illustrative, non-limiting embodiment of the present application, as defined by independent claim 1, a liquid crystal display panel includes an array substrate including a driving element for controlling a driving voltage and a display electrode to which a voltage is applied through the driving element are formed, a first polarization layer for polarizing the light passing through the array substrate, a liquid crystal layer having a liquid crystal material, a color filter substrate on which a color filter made of a color material film is formed, and a second polarization layer for polarizing the light passing through the color filter substrate, wherein the array substrate, the first polarization layer, the liquid crystal layer, the color filter substrate, and the second polarization layer are successively superposed.

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In another exemplary embodiment of the present application, as defined by independent claim 5, the light reflected from the array substrate of the liquid crystal display panel directly returns to the backlight unit without passing through other layers, a polarization layer is disposed between the array substrate and the color filter substrate of the liquid crystal display panel, and the light reflected from the array substrate returns to the backlight unit without passing through the polarization layer so as to improve the light-recycling efficiency of the backlight unit.

In another exemplary embodiment of the present application, as defined by independent claim 7, a display electrode and a wiring conductively connected to the display electrode are formed on the array substrate and the reflection film is formed on a gap between the display electrode and the wiring.

In another exemplary embodiment of the present application, as defined by independent claim 10, the metal film is formed on a gap between the display electrode and the driving element.

Conventional liquid crystal display devices improve the brightness by increasing the aperture ratio by increasing the number of backlights or increasing the capacity of the backlight of the device. However, these solutions increase the size and weight of the device, which is disadvantageous for many applications, such as a liquid crystal display for a notebook-type personal computer.

The claimed invention, on the other hand, provides a liquid crystal display having improved brightness resulting from improved light-recycling efficiency, as opposed to increasing the aperture ratio.

That is, in the claimed invention, the polarization plate is not disposed between the array substrate and the light guide plate, thereby reducing absorption of the reflected light by the

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polarization plate and improving light-recycling efficiency and brightness of the liquid crystal display (e.g., see specification at page 7, lines 16-28).

II. 35 U.S.C. § 112 REJECTION

Claim 13 stands rejected under 35 U.S.C. § 112, second paragraph.

Claims 1 and 13 are amended to provide proper antecedent basis and to define more clearly and particularly the features of the claimed invention, thereby overcoming this rejection.

Applicants submit that claim 13 is clear and definite and therefore requests that the Examiner withdraw this rejection.

III. THE PRIOR ART REJECTIONS

A. Claims 1 and 2 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Jones in view of Ichihashi. For at least the following reasons, Applicants respectfully traverse this rejection.

The Examiner acknowledges that Jones does not disclose or suggest a first polarization layer over the display electrode. However, the Examiner asserts that Ichihashi makes up for the deficiencies of Jones by allegedly disclosing a polarizing film 16 over a display electrode (ITO film 12), and that modifying Jones in view of Ichihashi would have been obvious to obtain an LCD device having excellent visual angle characteristics (see Ichihashi at column 3, line 15).

Applicants submit that, however, that there are elements of claims 1 and 2 which are not disclosed or suggested by Jones and Ichihashi, either individually or in combination.

Indeed, Applicants submit that the alleged combination of Jones and Ichihashi would not improve overall transmittance, according to the claimed invention.

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For example, the claimed invention improves overall transmittance of the LCD panel by polarization layer placement inside of the array substrate.

Turning to the exemplary aspects of the invention described in the specification, a first polarization layer (e.g., 14) is integrated on the array substrate (e.g., 15) (inner side of the array substrate) and a second polarization layer (e.g., 12) (normal polarizer separately fabricated) is disposed on a color filter substrate (outer side) (all reference numerals herein being used for the Examiner's clarity only and not for limiting the claims).

A non-opening area of the array substrate (e.g., 151, 156, 158) (non-ITO metal area) reflects the light from a backlight (e.g., 17) directly back into the backlight (e.g., see Figures 2 and 4).

Turning to the language of the claims, independent claim 1 recites, *inter alia*:

*an array substrate including a driving element for controlling a driving voltage and a display electrode to which a voltage is applied through the driving element are formed;
a first polarization layer for polarizing the light passing through the array substrate;
a liquid crystal layer ...;
a color filter substrate ...; and
a second polarization layer ...,
wherein the array substrate, the first polarization layer, the liquid crystal layer, the color filter substrate, and the second polarization layer are successively superposed* (emphasis added).

On the other hand, dependent claim 2 recites, *inter alia*, that “a common electrode is formed on the array substrate and an electric field is generated in a direction parallel with the array substrate by applying a voltage between the display electrode and the common electrode”.

According to the exemplary aspects of the claimed invention, as defined for example by claim 2, the present invention provides an “in-plane switching structure” (e.g., see Figures 1 and

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2) wherein an electric field is formed between the common electrode (e.g., 157) and the display electrode (e.g., 156) in a direction parallel with the array substrate.

Moreover, a display electrode (e.g., 156) can be formed under a first polarization layer (e.g., 14; see also Figures 2 and 4).

Thus, since the polarization layer is not formed between the substrate and the driving element or the substrate and the display electrode, the light reflected by the driving element and display electrode returns to the backlight unit without passing through the polarization layer (e.g., see specification at page 7, lines 18-23). Accordingly, the light-recycling efficiency and brightness of the liquid crystal display can be improved.

In comparison, with respect to Jones, the Examiner acknowledges that Jones does not disclose or suggest a first polarization layer over the display electrode. Particularly, Figure 2 of Jones discloses a polarization layer 53 and an orientation layer 55 disposed between the substrate 3 and the other layers of the display panel, including the pixel electrodes 7 (i.e., display electrode) and the common electrode 15.

However, the Examiner asserts that Ichihashi makes up for the deficiencies of Jones by allegedly disclosing a polarizing film 16 over a display electrode (ITO film 12), and that modifying Jones in view of Ichihashi would have been obvious to obtain an LCD device having excellent visual angle characteristics (see Ichihashi at column 3, line 15).

Applicant notes that Jones teaches a three polarizer system (i.e., 31, 17, and 53; see, e.g., Figure 2 of Jones), which results in lower light transmittance emitted from the backlight. Indeed, the transmittance of polarizer cannot exceed 50% (actually 40%) (e.g., see Jones at column 8, lines 12-16). Thus, the three layer polarizer system according to Jones will, in fact, show very poor light transmittance.

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On the other hand, Ichihashi teaches two polarizing layers (i.e., 14 and 16) inside the substrate 10 with an orientation film 14 underneath each polarizing film 16, which results in a complicated two-step fabrication process. That is, Ichihashi requires the orientation film layer and the polarizing layer to form the polarization layer. Indeed, it is noted that the claimed invention does not require such a complicated two step process to form the polarization layer.

Applicants respectfully submit that it would not have been obvious to modify the three polarizer system of Jones in view of the two polarizer system of Ichihashi, which would necessitate a complicated two-step fabrication process of each polarizing film, to arrive at the claimed invention, as alleged by the Examiner.

Moreover, even assuming *arguendo* that such a combination would have been obvious, Applicants submit that the resulting combination of Jones and Ichihashi clearly would not arrive at all of the features of the claimed invention, or for that matter, provide the advantages thereof.

Indeed, Applicants submit that the alleged combination of Jones and Ichihashi would not improve overall transmittance, according to the claimed invention.

For the foregoing reasons, Applicants submit that Jones and Ichihashi, either individually or in combination, do not disclose or suggest all of the features of claims 1 and 2. The Examiner respectfully is requested to reconsider and withdraw the rejection of claims 1 and 2.

B. Claims 4-6, 11, 12, and 14-18 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Jones in view of Ichihashi, in further view of Applicants' Admitted Prior Art (Figures 11 and 12).

As mentioned above, claim 5 is rewritten in independent form and claim 4 correspondingly is canceled without prejudice or disclaimer.

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With respect to independent claim 5, Applicants submit that Jones, Ichihashi, and Applicants' Admitted Prior Art (Figures 11 and 12) do not disclose or suggest all of the features of claim 5 for reasons similar to those set forth above.

For example, independent claim 5 recites, *inter alia*, that:

the light reflected from the array substrate of the liquid crystal display panel directly returns to the backlight unit without passing through other layers, wherein:

a polarization layer is disposed between the array substrate and the color filter substrate of the liquid crystal display panel; and the light reflected from the array substrate returns to the backlight unit without passing through the polarization layer so as to improve the light-recycling efficiency of the backlight unit (emphasis added).

Thus, Applicants submit that Jones, Ichihashi, and Applicants' Admitted Prior Art (Figures 11 and 12) do not disclose or suggest all of the features of claim 5 for somewhat similar reasons as those set forth above with respect to claim 1.

Also, according to the claimed invention, a display electrode (e.g., 40) can be formed on a polymer layer (e.g., 39) and connected to the driving element by penetrating the polymer layer (e.g., see Figure 9). Such exemplary aspects are defined, for example, by claims 11 and 13).

For example, independent claim 11 recites a liquid crystal display device, including:

an array substrate provided with an insulating substrate, a thin film transistor formed on the insulating substrate, a polymer layer which covers the insulating substrate and in which polarization elements are dispersed, and a display electrode which is formed on the polymer layer and penetrates the polymer layer and a part of which conductively connects with the thin film transistor;

a color filter substrate disposed so as to face the array substrate by keeping a predetermined gap with the array substrate; and a liquid crystal layer located at the gap between the array substrate and the color filter substrate; and

a backlight unit for applying light to a liquid crystal display panel from the outside of the array substrate (emphasis added).

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Thus, a polymer layer with dispersed polarization element (e.g., 39) therein added to the element, and the display electrode (ITO) (e.g., 40) can be disposed on the polarization layer (e.g., see Figure 9). Accordingly, this structure provides a display area (e.g., 40) that can be enlarged (e.g., as exemplarily defined by claim 12; see, e.g., Figure 9) to improve brightness.

In comparison, Ichihashi only discloses that the display electrode (ITO) is placed underneath the polarizing film (i.e., integrated on the substrate).

Therefore, even assuming *arguendo* that it would have been obvious to combine the cited references in the manner alleged by the Examiner, Applicants respectfully submit that the resulting combination of such references still would not disclose or suggest all of the novel and unobvious features of the claimed invention, as defined for example, by independent claim 11 (and dependent claim 12).

Claims 12 and 14-18 also are patentable over the alleged combination at least by virtue of their dependencies from independent claims 1, 5, and 11, respectively.

Thus, the Examiner is requested to reconsider and withdraw this rejection and to permit claims 5, 6, 11, 12, and 14-18 to pass to immediate allowance.

C. Claims 7 and 10 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Jones in view of Applicants' Admitted Prior Art (Figures 11 and 12) in view of Yoshihiro. Applicants respectfully traverse this rejection for the following reasons.

Applicants submit that neither Jones, Applicants' Admitted Prior Art (Figures 11 and 12), or Yoshihiro, either alone or in combination, discloses or suggests at least these features of independent claims 7 and 10.

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As mentioned above, Jones teaches a three polarizer (i.e., 31, 17, and 53) system, and results in lower light transmittance emitted from the backlight. The transmittance of polarizer cannot exceed 50% (actually 40%). Thus, the three layer polarizer system according to Jones will show very poor transmittance.

On the other hand, Yoshihiro teaches the surface treatment of metal layer 20 on the insulating layer to prevent the occurrence of hillock and the reflection from the backlight in order to improve the contrast ratio (e.g., see Yoshihiro at Abstract). Applicants note, however, Yoshihiro does not teach or suggest that the planarization layer 38 serves as a polarizing layer.

In comparison, independent claim 7 recites, *inter alia*, that “a display electrode and a wiring conductively connected to the display electrode are formed on the array substrate” and that “the reflection film is formed on a gap between the display electrode and the wiring.”

Similarly, independent claim 10 recites, *inter alia*, that “the metal film is formed on a gap between the display electrode and the driving element.”

In the exemplary aspects of the claimed invention, the reflection film or metal layer (e.g., 259) is additionally disposed on a gap (e.g., space), without decreasing the effective opening area (i.e., just covering the disordered area of liquid crystal alignment), to improve transmittance by reflecting the light from the backlight directly back into the backlight (e.g., as exemplarily defined by independent claims 1 and 4; see also Figures 5 and 7).

Moreover, Applicants submit that, assuming *arguendo* that the alleged combination of Jones, Applicant's Admitted Prior Art (which is not mentioned in the text of this rejection), and Yoshihiro teaches a contrast improvement for LCD, such a combination still would not teach or suggest improving the brightness by recycling the emitted light from backlight, according to the claimed invention.

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Thus, Applicants respectfully submit that there are elements of claims 7 and 10 that are not disclosed or suggested by Jones, Applicants' Admitted Prior Art (Figures 11 and 12), and Yoshihiro, either alone or in combination. Therefore, Applicants respectfully request that the Examiner reconsider and withdraw the rejection of these claims.

D. Claim 9 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Jones in view of Applicants' Admitted Prior Art (Figures 11 and 12), in view of in view of Yoshihiro, and further in view of Ichihashi.

Applicants submit that claim 9 is patentable over the cited references by virtue of its dependency from claim 7, as well as for the additional features recited therein.

For example, claim 9 recites, inter alia, that "*a polarization layer is formed between the array substrate and the color filter substrate of the liquid crystal display panel.*"

Thus, Applicants request that the Examiner reconsider and withdraw this rejection and permit claim 9 to pass to immediate allowance.

IV. REQUEST FOR REJOINDER OF NON-ELECTED SPECIES

Applicants respectfully request that the Examiner rejoin and allow non-elected claim 3 based on its dependency from generic claim 1.

V. NEW CLAIMS

New claims 19 and 20 are added to provide more varied protection for the present invention, as illustrated, for example, in Figure 2. Applicants submit that claims 19 and 20 also are patentable over the cited references, either individually or in combination, as least for

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somewhat similar reasons as those set forth above, as well as for the additional features recited in claims 19 and 20.

VI. CONCLUSION


In view of the foregoing, Applicants submit that claims 1-3, 5-7, and 9-20, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Assignee's Deposit Account No. 50-0510.

Respectfully Submitted,

Date: September 2, 2005

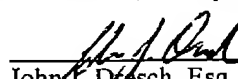

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CERTIFICATE OF TRANSMISSION

I certify that I transmitted via facsimile to (571) 273-8300 the enclosed Amendment under 37 C.F.R. § 1.111 to Examiner Dung T. Nguyen, Art Unit 2871, on September 2, 2005.


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